LOUISIANA'S BEACH PROGRAM

QUALITY ASSURANCE PROJECT PLAN

Submitted to U.S. Environmental Protection Agency
In Partial Fulfillment of Federal Assistance Agreement Number CU-97606401-0
for Development of Coastal Recreation Water Monitoring and Public Notification

Louisiana Department of Health and Hospitals

Office Of Public Health

**6867 Bluebonnet Boulevard
Baton Rouge, Louisiana 70810**

December 2003

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Submitted December ⬜, 2003

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Louisiana Department Of Health And Hospitals
Office of Public Health

Center for Environmental Health Services

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Quality Assurance Officer

Division of Laboratories

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Henry B. Bradford, Ph.D.   Date   Joan B. Bostick, Ph.D.   Date
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Amy May   Date   Joan Brown   Date
Project Officer   USEPA Chief
Assistance Programs Branch   Assistance Programs Branch
Approving Official   Approving Official

Prepared By: Robert Wagner, Ph.D.
Quantitative Ecological Services, Inc.

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Lake Pontchartrain Basin Foundation

A4. Project/Task Organization

Project organization is outlined in Figure A4.1. The Louisiana Department of Health and
Hospitals (LDHH), Office of Public Health (OPH) personnel will be responsible for maintaining
the quality assurance/quality control (QA/QC) requirements of all field data collection,
laboratory analyses, and data management/reporting. Project responsibilities for key project
personnel include:

- Louisiana BEACH Program Manager/ Quality Assurance Officer (Bruce Champion) -
  has the responsibility and authority to direct all aspects of program implementation, and
  is the final authority determining when resampling and advisories are warranted. The
  Louisiana BEACH Program Manager serves as the program's QA officer and provides
  oversight for the implementation of the quality assurance project plan (QAPP). The
  Louisiana BEACH Program Manager will communicate with the U.S. Environmental
  Protection Agency's (USEPA) Technical Project Manager and the Project Officer to
  ensure that data generated by the program meet USEPA requirements and will provide
  adequate documentation that the program is achieving its QA/QC standards. At a
  minimum, the Program Manager will audit the program annually to document that the
  program's data quality goals are being met. The BEACH Program Manager will also be
  the Program's primary point of contact, except as he otherwise designates, and will be
  responsible for submitting all data and required reports to USEPA

- Field Activities Manager (Stephen Locke) – is responsible for 1) ensuring that all field
  data collection personnel are adequately trained to collect data in accordance with the
  standard operation procedures (SOP), 2) ensuring that data are collected consistently
  among field personnel in order to limit observer effects, and 3) oversight of all field
  operations to ensure on schedule completion of assigned fieldwork with strict adherence
  to SOPs. The Field Activity Manager will immediately report any failure to fully meet
  SOP requirements to the Louisiana BEACH Program Manager.

- Laboratory Activities Manager (Dr. Henry Bradford) – is responsible for 1) overseeing
  laboratory analyses of water samples 2) data processing duties related to the parameters
  analyzed by the laboratory under this program, 3) ensuring that the QA/QC procedures
  that have been established by the laboratory for those parameters and the guidelines of
  this QAPP are followed, and 4) ensuring that analytical tests are performed in accordance
  with approved methods. The Laboratory Activities Manager will immediately report to
  the Louisiana BEACH Program Manager any failure to meet any of the laboratory's
  QA/QC guidelines that pertain to analyses conducted for this program. All laboratory
  analyses conducted under this program will be performed under the supervision of the
  Laboratory Activities Manager.

- Data Manager (Stephen Locke) – is responsible for 1) ensuring that all data collected by
  the program are entered into the Program's Database accurately and timely 2) conducting
  database administrative functions, including correction of historic data, maintaining
  periodic backups of the database, processing all statistical/classification analyses, and 3)

notifying the appropriate persons when follow up actions or advisories are indicated by statistical/classification analyses. The Data Manager will also be responsible for reporting all data collected under this program to USEPA in a timely fashion.
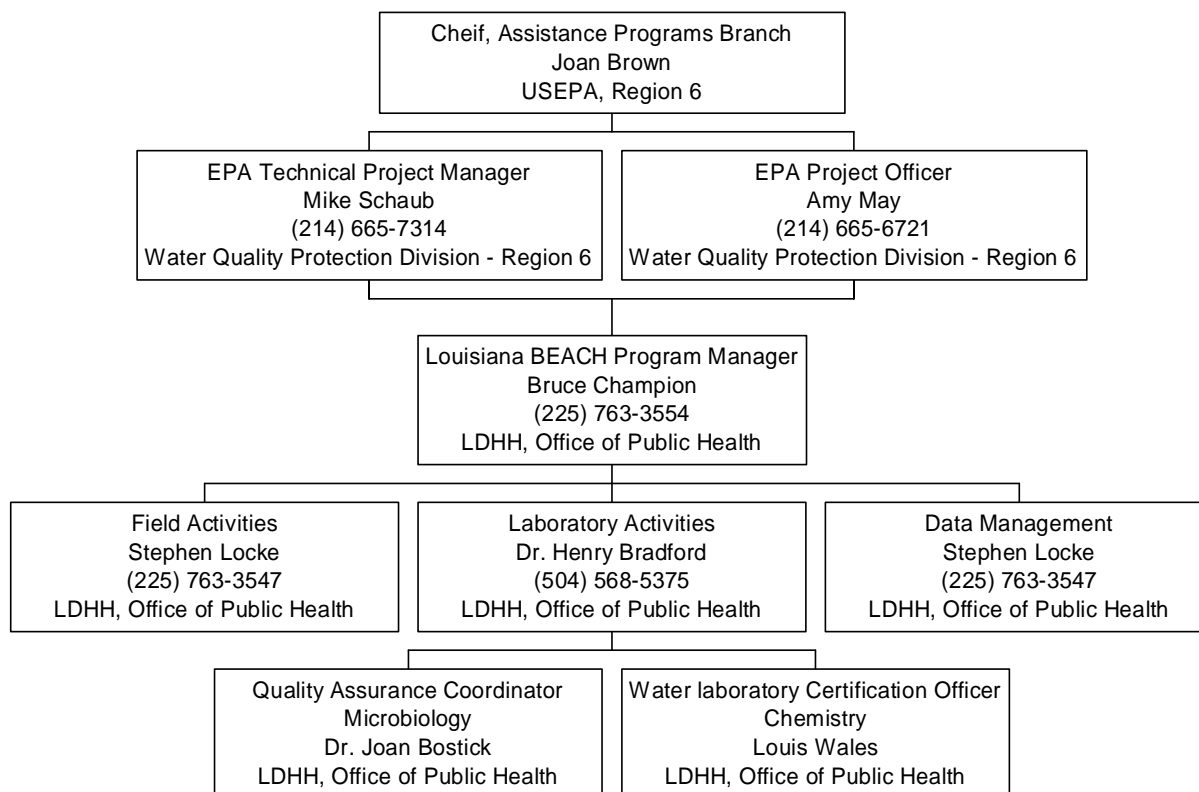
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                    │       USEPA, Region 6             │
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                │       Bruce Champion           │
                │       (225) 763-3554           │
                │  LDHH, Office of Public Health │
                └──────────────────────────────┘
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Field Activities	Laboratory Activities	Data Management
Stephen Locke	Dr. Henry Bradford	Stephen Locke
(225) 763-3547	(504) 568-5375	(225) 763-3547
LDHH, Office of Public Health	LDHH, Office of Public Health	LDHH, Office of Public Health

Quality Assurance Coordinator	Water laboratory Certification Officer
Microbiology	Chemistry
Dr. Joan Bostick	Louis Wales
LDHH, Office of Public Health	LDHH, Office of Public Health

Figure A4.1. Project organization chart.

A5. Problem Definition And Background

The Beaches Environmental Assessment, Closure, and Health (BEACH) grant program was initiated by USEPA in 1997 in response to the growing concern about public health risks posed by polluted bathing beaches. USEPA established this national program to protect public health at our nation's beaches and to ensure timely notification of the public when they may be at risk of illness due to contact with polluted waters. The BEACH Act, passed on October 10, 2000, as an amendment to the Clean Water Act (CWA), provides states and tribal authorities with funding and guidance to establish statewide/tribal lands BEACH Programs to determine pathogen indicator densities in coastal recreation waters, and to advise the public of those densities and the associated risk of primary contact activities in those waters (USEPA 2002a). Responsibility for developing and implementing Louisiana's BEACH Program was assigned by the State of Louisiana to LDHH in 2002. With funding from USEPA, LDHH has developed a coastal

recreational waters monitoring and public notification program, known as Louisiana's BEACH Program, which is described in *Louisiana's BEACH Grant Final Report, Grant Year 2001* ("Beach Report"; LDHH 2003). The Beach Report identifies beach sites located in Louisiana's coastal recreation waters, identifies water quality issues for each beach site, and describes how Louisiana will implement the program.

This QAPP defines the objectives of the sampling program, as well as methods, organization, and quality management activities necessary to meet program goals prior to initiating sample collection, and was prepared in accordance with *EPA Guidance For Quality Assurance Project Plans* (USEPA 1998). This QAPP also fulfills USEPA's requirement that an approved QAPP that addresses and implements the specifications in *Requirements for QA Project Plans for Environmental Data Operations* (USEPA QA/R-5) be in place prior to collection of environmental data. LDHH will be the principal data user/decisions maker under Louisiana's BEACH Program, and is responsible for the preparation of this QAPP.

Typically a QAPP is prepared to ensure that data collected for a designed experiment or observational study are adequate to address the study's hypotheses. However, in this case, LDHH has accepted USEPA's guidance, which is detailed in *National Beach Guidance and Required Performance Criteria for Grants* (USEPA 2002a), in the development of Louisiana's BEACH Program, augmented by Louisiana's existing administrative code requirements pertaining to water quality monitoring of waters used for primary contact recreation. LDHH has fully adopted USEPA's guidance for establishing sampling locations, sampling intervals, sampling methods, sampled indicator organism, and statistical decision rules and estimated sampling variability. USEPA's guidance has been merged with Louisiana's existing primary contact decision rule to produce a unified sampling program and decision process.

A6. Project/Task Description And Schedule

The objectives of Louisiana's BEACH Program are to:
1. Collect data representative of the water quality conditions at monitored beaches that are of sufficient accuracy and quantity to make correct and timely assessments in accordance with the standards described in the Beach Report.
2. Use the monitoring data to assess water quality conditions at high and moderate risk beaches weekly during the period that the beaches are used for primary contact recreation.
3. Provide the results of those assessments to the public in a timely fashion in order that they may make informed decisions about the risk of participating in primary contact recreation at designated beach sites.

To develop a program that meets those objectives, Louisiana has delineated its coastal recreation waters, identified beaches within those waters that are regularly used by the public for primary contact recreation, and ranked each beach using a risk-based classification process (see Chapter 2 of the Beach Report).

Once states have developed a risked-based ranking of their beaches, USEPA recommends development of a three-tiered monitoring plan (USEPA 2002a). Different intensities of monitoring, varying with the risk of exposure assessed under the risk-based classification process, are required for each tier. LDHH has adopted this approach, as described in Chapter 3 of the Beach Report, and assigned each beach site to one of the three tiers (see Table 3.2 of the Beach Report). Sample sites for each beach have also been identified (see Section 3.1 and Table 3.3 of the Beach Report).

LDHH has also identified the "indicator organisms" that will be used by Louisiana's BEACH Program. Because it is difficult to directly detect the many different pathogens or parasites that may be present in surface waters, "indicator organisms" are the fundamental monitoring tool used to measure both changes in water quality and the potential presence of hard-to-detect target pathogenic organisms. An indicator organism provides evidence of the presence or absence of a pathogenic organism that survives under similar physical, chemical, and nutrient conditions. The Louisiana BEACH Program will use two indicator organisms to assess beach water quality, fecal coliform and enterococci. Fecal coliform is the primary indicator organism currently used as the standard to assess bacteriological water quality for "bathing beaches/places" by LDHH (LAC 51:XXIV §909.B), and to assess whether a water body's designated use, set by LDEQ (LAC 33:IX §1113.5), is being met. Enterococci will also be used because a number of recent epidemiological studies examining the relationship between swimming-associated health risks and bacteria presence have found that enterococci were the most predictive indicator for enteric disease symptom development in bathers at beaches in marine environments. Accordingly, enterococci are USEPA's recommended indicator organisms for monitoring marine recreational waters (USEPA 2002a and 2002b), and will be used by the Louisiana's BEACH Program in addition to fecal coliform.

Indicator organism densities, as well as physiochemical parameters that have been identified in other studies as being predictive of indicator organism densities, will be measured for each water sample collected under this program. Table A6.1 identifies the water quality parameters that will be sampled, the number of samples that will be collected, the matrix sampled, sample preservation and maximum holding times. River stage will also be recorded for any sample stations that are directly influenced by inland water discharge. Only indicator organism densities are required to assess water quality under the established decision rule described in Section A7 of this QAPP. Physiochemical parameters are being collected for future examination of their correlation with indicator organism densities and to evaluate the potential for development of predictive models of indicator organism densities that could augment the established decision rule.

To reduce sampling error, all samples will be collected under the supervision of licensed sanitarians or qualified environmental scientists, employed by or under contract with LDHH, that have been trained to collect samples in accordance with the program's SOP (see Appendix). All collected samples will be submitted to the closest LDHH's laboratory for analysis. Laboratory analyses will be conducted in accordance with the LDHH's laboratory's quality control/quality assurance (QA/QC) procedures. After samples have been collected and submitted to the laboratory for analysis, sample collection personnel will immediately submit a copy of

completed datasheets to the BEACH Program data management personnel. Laboratory results will be transferred to the BEACH Program data management personnel immediately by email or facsimile, followed by transfer of hardcopy results, which the program will retain for a minimum of three years. Environmental data and laboratory results will be entered into LDHH's BEACH Program database by LDHH staff immediately following receipt of results. To reduce common data entry errors, the database will limit the data that can be entered into each field to predefined categories or expected ranges, depending on data field type. The database will also automatically calculate the necessary statistics.

Samples collected at designated beach sample sites during the designated monitoring period will be evaluated in accordance with Louisiana's BEACH Program decision rule (see Section A7). The result of the decision rule is a dichotomous classification of water quality as "in compliance" or "out of compliance" with the rule. Water quality at designated beach sites that have been identified as posing a high to moderate potential for exposing primary contact users to water borne pathogens (identified as Tier 1 and 2, respectively; in the Beach Report, Section 3.1) will be classified weekly during the swimming season, and classification result made available to the public.

Louisiana's BEACH Program is intended to be a long-term program, operating annually from 1 April, one month before the start of the "recreational period" or "swimming season", and continuing through the end of the swimming season on 31 October (the designated monitoring period). Additional sampling will also be conducted outside the designated monitoring period to calibrate the decision rule prior to initial sampling and public notification during the designated monitoring period in 2004. Calibration sampling will be conducted at sites that were chosen to investigate the sensitivity of the water quality classification decision rule. These sites represent a range of water quality conditions, based on historic water quality data. Calibration sampling will begin immediately upon approval of this QAPP (Nov. – Dec., 2003) at Fontainebleau and Grand Isle State Parks, and Pontchartrain Beach. Calibration sampling at Fontainebleau and Grand Isle State Parks will transition to Tier 1 monitoring at the start of the 2004 swimming season (in April 2004). However, calibration sampling will continue at Pontchartrain Beach through the 2004 swimming season. Sampling may also occur throughout the year at Tier 3 beaches, anticipated to begin sometime after the 2004 recreational period. The long-term schedule for Louisiana's BEACH Program is outlined in Table A6.2.

A7. Data Quality Objectives

The purpose of this program is to provide the public with accurate and timely information about the water quality and associated risk of engaging in primary contact recreation at designated beaches in Louisiana's coastal recreational waters. For Tier 1 and 2 designated beach sites during the swimming season, sample results will be evaluated in accordance with Louisiana's BEACH Program decision rule and classified as "in compliance" or "out of compliance". This section describes the rational behind and the process for Louisiana's BEACH Program decision rule, and identifies the data quality objective (DQOs) for the sampled parameters.

Table A6.1. Water quality parameters to be sampled.

Parameter	Number of Samples	Matrix	Sample Preservation	Holding Time
Enterococci	1/week during Swimming Season[1]	Water	Partial emersion in wet ice at 1-4° C	≤ 6 hours
Fecal Coliform	1/week during Swimming Season[1]	Water	Partial emersion in wet ice at 1-4° C	≤ 6 hours
Salinity	1/week during Swimming Season[1]	Water	N/A	< 24 Hours
Surface Water Temperature	1/week during Swimming Season[1]	Water	N/A	N/A (Measured *in situ*)
Tide Conditions[2]	1/week during Swimming Season[1]	Water	N/A	N/A (Based on value reported by others)
Weather	1/week during Swimming Season[1]	Atmospheric conditions	N/A	N/A (Field observation)
Wind Direction[2]	1/week during Swimming Season[1]	Atmospheric conditions	N/A	N/A (Based on value reported by others)
Wind Speed[2]	1/week during Swimming Season[1]	Atmospheric conditions	N/A	N/A (Based on value reported by others)
Precipitation	Day of sample and each of 2 prior days[3]	Atmospheric conditions	N/A	N/A (Based on value reported by others)
River Stage (at sites directly influenced by river discharge only)	1/week during Swimming Season[1]	Water	NA	N/A (Based on value reported by others)

[1] Number of routine samples at Tier 1 and 2 beaches. Calibration samples will be collected weekly during November/December 2003 through October 2004 at selected sites. Routine samples at Tier 3 beaches may be less frequent than once/week, and sampling may occur at any time throughout the year. [2] See Field Datasheet for permitted values; values reported by NOAA. [3] Data will be obtained from the Louisiana Molluscan Shellfish database.

Table A6.2. Schedule of tasks for Louisiana's BEACH Program.

Task	Start Date	Completion Date
1. QAPP Review and Revisions	Nov. 2003	Nov. – Dec. 2003
2. Conduct calibration sampling at selected designated beach sites (Fontainebleau and Grand Isle State Parks)	Jan 2004	Mar. 31, 2004
3. Conduct calibration sampling at calibrations site (Pontchartrain Beach)	Jan 2004	Oct. 31, 2004
4. Conduct routine sampling at three State Parks (Fontainebleau, Grand Isle and Cypermort Point State Parks)	Apr. 1, 2004	Oct. 31, 2004
5. Submit 2004 routine and calibration data to USEPA	NA	Jan. 2005
6. Identify additional beach sites to be monitored in the next swimming season	On-going	Jan. annually
7. Conduct routine monitoring of designated beaches	Apr. 1 annually	Oct. 31 annually
8. Submit previous year's monitoring data and annual report to USEPA	NA	Jan. annually

Bacteriological Water Quality Criteria.

Louisiana's criteria for bacteriological water quality for bathing beaches/places and primary-contact recreation state that the fecal coliform count shall not exceed 200 colony forming units (cfu) (either MPN of MF) per 100 ml as a 30-day geometric mean based on not less than five samples during any 30-day period nor exceed 400 cfu/100 ml in more than 10 percent of all samples during any 30-day period (LAC 51:XXIV §909.B; LAC 33:IX §1113.5i). This standard was based on USEPA's recommendations in *Quality Criteria for Water* (USEPA 1976). The standard was established by USEPA based on evaluation of bacteriological data that indicated that using a fecal coliform indicator group maximum geometric mean of 200-cfu/100 ml would result in an estimated 19 illnesses per 1,000 swimmers at marine beaches. However, that relationship was only approximate (USEPA 1986).

The enterococci criteria recommended by USEPA were developed using the geometric mean indicator densities corresponding to the accepted gastrointestinal illness rate of 19 illnesses per 1,000 swimmers. The beach is in noncompliance with the criteria if the geometric mean exceeds 35-cfu/100 ml (USEPA 1986, 2002a and 2002b). Noncompliance is also triggered by an unacceptably high value for any single sample. The maximum acceptable bacterial density for a single sample is set higher than the geometric mean in order to avoid unnecessary

noncompliance events based on single samples. However, decisions about beach water quality should be based primarily on the long-term geometric mean bacterial density rather than single sample values. Bacterial densities fluctuate day-to-day around the mean, and thus a decision based on a single sample, or even several samples, may be erroneous; i.e., the sample may exceed the recommended mean criteria even though the long-term geometric mean has been met, or may fall below the maximum even if the mean is in the noncompliance range (USEPA 1986, 2002a and 2002b).

The single sample maximum criterion is established based on a specified desired chance, or probability, that the beach will be identified as having adequate water quality when in fact water quality is acceptable, balanced by the offsetting probability of deciding that water quality threatens public health when in fact it does. Larger probability values used for the upper percentile decision limit correspond to less stringent (i.e. higher) maximum values, decreasing the chance that the beach will be erroneously classified as not in compliance, but increasing the chance of failing to classify a beach as not in compliance when public health is truly at risk. USEPA has specified the desired upper percentile for designated bathing beaches at 75%, based on the Agency's judgment, which, when combined with the observed sample variability from USEPA studies (assumed log-normal distribution and log standard deviation = 0.7 cfu/100ml), results in a single sample maximum allowable enterococci density of 104 cfu/100 ml (USEPA 1986, 2002a and 2002b). Although Louisiana's bacteriological water quality criteria for fecal coliform densities are not expressed in terms of a single sample allowable maximum, the requirement that not more than 10 percent of all samples during any 30-day period exceed 400 cfu/100 ml in essence constitutes a single sample maximum (i.e., a single sample constitutes 1 of the 5 routinely scheduled samples in the 30-day analysis period, or 20% of the samples). Therefore, the fecal coliform single sample maximum for Louisiana's BEACH Program will be 400 cfu/100ml.

The bacteriological measures of water quality described above fall into two categories: those measuring long-term or steady-state conditions, and those measuring current or proximate conditions. The geometric mean criteria for fecal coliforms and enterococci, and the maximum percent of samples exceeding the single sample maximum for fecal coliforms are steady-state measures. The single sample maximums are proximate measures. In summary, the bacteriological water quality criteria that will be used for Louisiana's BEACH Program are:

	Fecal Coliforms[*]	Enterococci[*]
Steady-State Criteria		
Geometric mean maximum	200	35
Maximum % of samples exceeding single sample maximum	10%	N/A
Proximate Criteria		
Single Sample Maximum	400	104

[*]Quantities are expressed as cfu/100 ml.

Louisiana's BEACH Program Water Quality Classification Decision Rule

On a weekly basis during the swimming season, LDHH will classify water quality at each sampling location on Tier 1 and 2 beaches as "in compliance" or "out of compliance" with the bacteriological criteria. Fecal coliform and enterococci steady-state geometric means, and the percent of samples with fecal coliform densities greater than the single sample maximum (400 cfu/100ml) will be calculated for each sampling location based on water quality sample results collected during the classification week and all samples collected in the preceding four weeks (a total of five weeks), and compared with the criteria. If any of the steady-state criteria are exceeded, the sampling location will be classified as "out of compliance". The sampling location will remain classified as "out of compliance" until all steady-state conditions are less than or equal to the maximum criteria (single sample criteria must also be met). If a sampling location is classified as "out of compliance" and LDHH believes that water quality has improved, they may collect samples in addition to the scheduled weekly samples. If these additional samples are in compliance, they may reduce the time that a sampling location is "out of compliance".

If the weekly sample's fecal coliform and enterococci densities are greater than the single sample maximum criteria, LDHH will either classify the sampling location as "out of compliance" or resample. If the sample result is determined to be accurate and standards are indeed being exceeded, the sampling station will be classified as "out of compliance". Resampling will only be conducted when there is reason to doubt the accuracy or certainty of the first sample based on predefined quality assurance measures. Resampling will be considered reasonable when the location's sampling results fail to meet predefined laboratory quality assurance measures or when a sampling location's results have historically been in compliance and no known or potential sources of fecal contamination are present. If a single sample maximum criterion was exceeded, the sampling location will remain classified as "out of compliance" until all bacteriological criteria are met.

If the sampling location's steady-state conditions are less than the maximum criteria AND proximate conditions (the weekly sample's fecal coliform and enterococci densities) are less than or equal to the single sample maximum criteria, then the sampling location would be classified as "in compliance". Figure A7.1 graphically depicts this classification decision process.

Sampling after an advisory will typically occur on the next regularly scheduled sample collection date (i.e., the next week), unless the conditions that resulted in the issuance of the advisory are believed to be anomalous or transitory. In that case, more frequent sampling could be undertaken in an effort to "sample into compliance". Because Louisiana's decision rule includes two steady-state criteria (geometric mean and % of samples maximum), the previous "30-days" sample results will be examined to determine the likelihood of being able to sample into compliance. Additional sampling will only be conducted when the program manager determines that additional sampling is likely to expedite lifting the advisory.

The Louisiana BEACH Program database will automate the classification process, performing all necessary calculations and generating the appropriate weekly classification for each sampling location. Immediately following the weekly classification process, LDHH will implement the

public notification and risk communications provisions described in Chapter 4 of the Beach Report.

<u>Louisiana BEACH Program DQOs</u>
Data quality objectives for the parameters measured under this QAPP (both field and laboratory) can be expressed in terms of accuracy, precision, and completeness goals (Table A7.1). Those DQOs were established by obtaining estimates of the most likely data quality that is achievable based either on manufacturer's specifications, scientific experience, or historical data. DQOs presented in Table A7.1 are used as quality control criteria both for field and laboratory measurement processes to set the bounds of acceptable measurement error. DQOs are usually established for six aspects of data quality: precision, bias, accuracy, representativeness, comparability, and completeness (USEPA 1998, 2002a). Each of these terms are described in the context of their application within Louisiana' BEACH Program below.

Precision - is a measure of agreement among replicate measurements of the same property, under prescribed similar conditions (USEPA 2002a). The upper and lower 95% confidence intervals of individual samples will be estimated using IDEXX® MPN Generator© software for enterococci densities and Standard Methods tables for fecal coliform densities when needed. The precision of sampling methods will be estimated by comparing laboratory results for two samples taken consecutively on the same day at the same sampling site. The precision of laboratory analyses (intra-laboratory) plus sample handling and transport, will be estimated by analyzing two aliquots of the same water sample, which will be subdivided in the field. Replicate and subdivided samples will be collected for approximately 10 percent of routine samples. The sample events (sample point and week) at which replicate and subdivided samples will be collected, will be randomly selected at the beginning of each annual sampling period. Sampling and analysis precision will be estimated from duplicate samples by calculating the relative percent difference (RPD) as follows:

$$RPD = \frac{|C_1 - C_2|}{(C_1 + C_2)/2} \; x \; 100$$

where C_1 is the first of the two values and C_2 is the second value. Because indicator organism densities are assumed to be log-normally distributed, RPD will be calculated on the logarithm (base 10) of sample results.

Bias - is the systematic or persistent distortion of a measurement process that causes errors in one direction (USEPA 2002a). Bias assessments for environmental measurements are typically based on analysis of spiked samples, which is not feasible for microbiological samples. It is assumed that bias will be minimized in this study by close adherence to SOPs and QA plans.

Accuracy - is the degree of agreement between an observed value and an accepted reference or true value. Accuracy is a combination of random error (precision) and systematic error (bias), both of which are due to sampling and analytical operations (USEPA 2002a). Accuracy is estimated by comparing the measured value to its "true" value. Because microbiological analysis measures constantly changing living populations, the true values cannot be known.
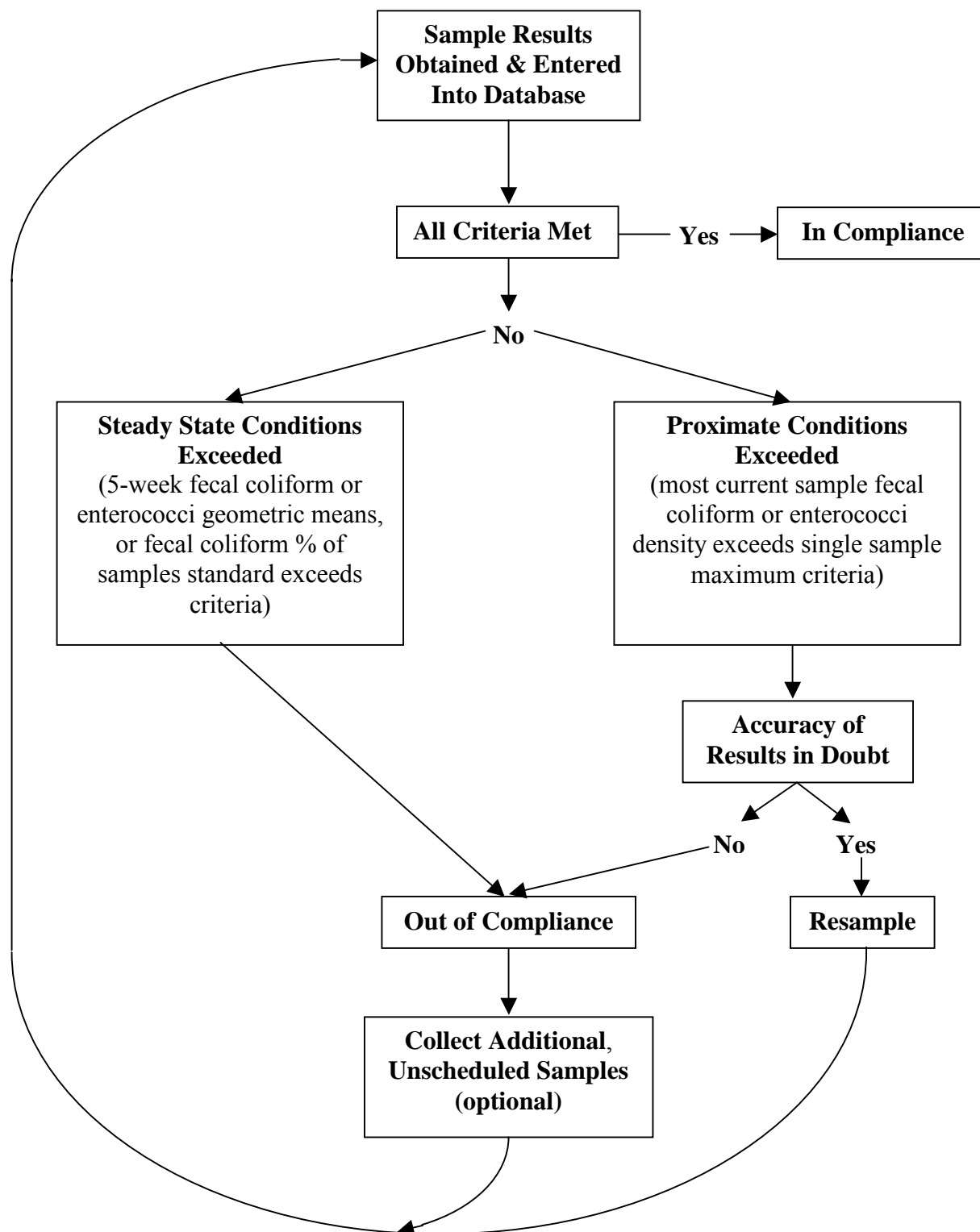
Figure A7.1. Louisiana's BEACH Program sampling station water quality classification decision process flow chart

Table A7.1 Data quality objectives for Louisiana's BEACH Program monitoring indicators.

Parameter	Concentration Units	Matrix	Method	Measurement Range	Reporting Level	Precision (RPD)	Accuracy	Completeness
Enterococci	MPN/100ml	Water	ASTM D6503-99[1]	1 to 2,419	1	Sample 10%; lab 5%[3]	Sample 10%; lab 5%[3]	98%
Fecal Coliform	MPN/100ml	Water	A-1-M method[2]	1 to1,600	1	Sample 60%; lab 30%[3]	Sample 60%; lab 30%[3]	98%
Salinity	ppt	Water	Standard Methods# 4500-CL	1 to 15 w/o dilution	1	Sample 5%, lab 2.5%	Sample 5%, lab 2.5%	98%
Surface Water Temperature	°F	Water	Field	-40 to 160	1	$\pm$ 2°	$\pm$ 2°	98%
Tide Conditions	NA	Atmospheric conditions	Digital transfer	See sample form for permitted values	NA	NA	NA	98%
Weather	NA	Atmospheric conditions	Field	See sample form for permitted values	NA	NA	NA	98%
Wind Direction	NA	Atmospheric conditions	Digital transfer	See sample form for permitted values	NA	NA	NA	98%
Wind Speed	NA	Atmospheric conditions	Digital transfer	See sample form for permitted values	NA	NA	NA	98%
Precipitation	Inches/previous 24 hours	Atmospheric conditions	Digital transfer	0+	NA	NA	NA	98%
River Stage	Feet on flood gauge	Water	Digital transfer	Gauge dependent	NA	NA	NA	98%

[1] Enterolert® Quanti-Tray 2000. [2] *Official Methods of Analysis of the AOAC*, 15th Edition 1990, p436-437; or Fecal Coliform Direct Test (A-1 Medium). 9221 E.2. *Standard Methods for the Examination of Water and Wastewater, 20th Edition.* [3] Because indicator organism densities are assumed to be log-normally distributed, RPD will be calculated on the logarithm (base 10) of sample results.

Accordingly, accuracy, like bias, is difficult to assess for microbiological analyses. However, because indicator organism density estimates are assumed to have minimum bias, accuracy equates to precision, which will be rigorously assessed.

Accuracy is also defined as the similarity of an entity to its original form, which applies to all recorded information, data entry, and calculations. Accuracy will be controlled by double-checking sources, manual data entries, or electronic data transfers and performing recalculations. Environmental data and laboratory results will be entered into LDHH's BEACH Program database by LDHH staff immediately following receipt of results. To reduce common data entry errors, the database will limit the data that can be entered into each field to predefined categories or expected ranges, depending on data field type. The database will also automatically generate the necessary statistics, and based on those statistics, categorize water quality in accordance with the decision rule. Automation of these processes will reduce the potential for human errors, and increase the accuracy and consistency of water quality decision rule results.

Representativeness – is the degree to which data accurately and precisely represent the characteristics of a population, and therefore it addresses the natural variability or the spatial and temporal heterogeneity of a population. The sampling design should define the area of sample collection such that it is typical and representative of each area of concern. The Louisiana BEACH Program has accomplished this by selecting sample sites that have been identified as representative of the risk of exposure to bacteria contamination at each designated beach as described in Section B.1 of this QAPP and Section 3.1 of the Beach Report.

Comparability - Two data sets are considered comparable when the two sets can be considered equivalent with respect to the measurement of a specific variable or group of variables (USEPA 2002a). Louisiana's BEACH Program has been designed based on USEPA guidance, which will facilitate comparison of Louisiana's results with those of other coastal states BEACH programs. Adequate training of field sampling and laboratory personnel and the use of standardized methods for sampling and analysis of bacterial indicator densities will ensure comparability.

Completeness - is the percentage of measurements made that are judged to be valid according to specific criteria and entered into the data management system (USEPA 2002a). Accidental or inadvertent loss of samples during transport or lab activities should be avoided by close adherence to SOPs. However, in the event of a lost sample, immediate resampling of the sample site will provide a suitable replacement sample. The SOP also includes provision that will ensure entry of all collected sample data into the database. Percent completeness *(%C)* for measurement parameters will be estimated as follows:

$$\%C = \frac{V}{T} \; x \; 100$$

where *V* is the number of measurements judged valid and *T* is the total number of measurements.

A8. Special Training Requirements/Certification

All samples will be collected under the supervision of licensed sanitarians or qualified environmental scientists, employed by or under contract with LDHH, that have been trained to collect samples in accordance with the program's SOP (see Appendix) by the Field Activities Manager. The Field Activities Manager will evaluate field staffs' compliance with the SOP by auditing sample collection practices of all field personnel annually. All laboratory analyses will be conducted at LDHH laboratories under the direction of the Laboratory Activities Manager. Data entry staff receives training on the proper procedures to enter and validate data by the Data Manager.

A9. Documentation And Records

Documents that describe, specify, report, or certify activities performed in this QAPP are listed in Table A9.1. LDHH Molluscan Shellfish Program will retain all documents and associated digital data. Laboratory records and QA manuals will be retained at LDHH laboratories. The format of all data reporting will be consistent with the requirements and procedures for data validation and data assessment described in Sections B, C, and D of this QAPP.

Table A9.1. Documentation Records

Document/Record	Retention Time	Form
QAPP, amendments, and appendices	3 year minimum	Paper/digital
QAPP distribution documentation	3 year minimum	Paper/digital
Field data sheet/Laboratory results	3 year minimum	Paper/digital
Corrective action reports	3 year minimum	Paper/digital
Documentation of public notification efforts	3 year minimum	Paper/digital
Field SOPs	3 year minimum	Paper/digital
Annual reports	3 year minimum	Paper/digital
BEACH database	Permanent	Digital
BEACH GIS files	Permanent	Digital

Amendments/Revisions to the QAPP.
This QAPP is intended to be a living document, subject to revision as additional information becomes available, and accordingly, it is anticipated that changes may occur and amendments/revisions to the QAPP will be required. Amendments/Revisions to the QAPP are necessary to reflect changes in project organization, tasks, schedules, objectives, and methods; to improve operational efficiency; and to accommodate unique or unanticipated circumstances. Any requests for amendments/revisions will be directed to the Louisiana BEACH Program Manager in writing and will be reviewed/discussed by all applicable parties involved.

Any changes to technical procedures will be considered significant and will be reviewed by the Louisiana BEACH Program Manager and USEPA Project Officer to determine if they significantly affect the technical and quality objectives of the program. If so, the QAPP will be

revised and re-approved, and a revised copy will be sent to all persons on the distribution list. If it is determined by the Louisiana BEACH Program Manager and USEPA Project Officer that the amendments/revisions are not significant, then the amendments/revisions will become effective immediately and will be distributed by the Louisiana BEACH Program Manager to all personnel on the distribution list.

MEASUREMENT / DATA ACQUISITION

B1. Sampling Process Design

Rationale for the Design.
Louisiana's BEACH Program sampling design fulfills USEPA's guidelines in *National Beach Guidance and Performance Criteria for Grants* (USEPA 2002a), *Ambient Water Quality Criteria for Bacteria—1986* (USEPA 1986), and *Implementation Guidance for Ambient Water Quality Criteria for Bacteria* (USEPA 2002b). Louisiana has adopted USEPA's tiered monitoring approach under which sampling effort is proportionate to risk of exposure. Louisiana's BEACH Programs tiered sampling design is outlined in Table B1.1. The sampling schedule will be in accordance with Table A6.2 and the SOP (see Appendix).

Design Assumptions.
This design assumes that:
- Indicator organism densities at the selected sample sites are representative of the densities throughout the swimming area the sampling site was chosen to represent.
- Indicator organism steady-state conditions can be estimated with acceptable precision by the geometric mean of five samples.
- Single samples will have acceptable power to detect exceedances when they occur.

LDHH does not possess data to test these assumptions, but believes them to be reasonable based on USEPA's guidance.

Procedures for Locating and Selecting Environmental Samples.
For each beach that was assigned to a monitoring tier, the Louisiana BEACH Program selected sample locations based on density of beach use and proximity to potential sources of contamination. LDHH documented beach use during the Memorial Day weekend, 2002, using aerial photography, and analyzed the photographs to estimate the number of beach users at designated beaches and to identify the locations with the greatest density of use. Sanitary surveys of those beaches were conducted in accordance with USEPA's guidance (USEPA 2002a) during late February through early March 2003 to identify any known or potential sources of fecal contamination affecting designated beaches. Sample sites were then selected based on each beach's monitoring tier assignment, centered in the area of densest use, and adjusted for any known or potential sources of pollution detected during the sanitary surveys (see Section 3.1of the Beach Report for details). Selected sample locations for designated beach sites

Table B1.1. Louisiana's BEACH Program tiered sampling design.

Tier 1	Tier 2	Tier 3
When to Conduct Basic Sampling		
Sampling Period - Begins on April 1, one month before the start of the "recreational period" and continues through October 31 (end of "recreational period").	**Sampling Period -** Begins on April 1, one month before the start of the "recreational period" and continues through October 31 (end of "recreational period").	**Sampling Period –** Samples may be collected at any time during the year, with an effort to sample during adverse conditions, when indicator organism densities are expected to be highest.
Sampling Frequency - One sample will be collected per week during the sampling period.	**Sampling Frequency -** One sample will be collected per week during the sampling period.	**Sampling Frequency -** Will be variable, and designed to determine the range of indicator organism densities.
When to Conduct Additional Sampling		
After exceedance of a water quality standard – When bacterial concentrations exceed a water quality standard, LDHH will immediately either issue an advisory or resample. If a sample result is determined to be accurate and standards are indeed being exceeded, an advisory will be issued. Resampling will only be conducted when there is reason to doubt the accuracy or certainty of the first sample. Resampling will be considered reasonable when a beach's sampling results fail to meet predefined laboratory quality assurance measures, or when the beach's sampling results have historically met water quality standards and no known or potential sources of fecal contamination are present**.**		
Reclassify after an advisory – Additional sampling may be conducted to determine whether a public notification can be discontinued. Since an advisory will not be lifted without sample results meeting water quality standards, accelerated sampling may be conducted to remove the advisory sooner.		
After a sewage spill or pollution event – Additional sampling will be conducted immediately after a sewage spill or a significant pollution event where the potential exists that indicator organism levels may be expected to exceed the standards.		
After a heavy rainfall event – Additional samples may be collected following heavy rains at beaches where sample data indicate a statistically meaningful increase in indicator organism density with rainfall. LDHH anticipates that several years of data collection will be required at a monitored beach before this relationship can be examined.		
Where to Collect Samples		
A sampling point will be established in the middle of the area(s) of densest use and every 500 meters (1640 ft.) thereafter along densely used beach segments. In areas of low-density use, no portion of the designated beach will be > 1 mile from a sample station. If known or potential pollution sources are present, the sample point(s) will be located to capture the pollution source.	A sampling point will be established in the middle of the area(s) of densest use. For continuous beach segments, no portion of the designated beach will be > 2 miles from a sample point. If known or potential pollution sources are present, the sample point(s) will be located to capture the pollution source.	
What Water Depth to Sample		
Water samples will be collected 6-12 inches below the water's surface in knee-deep water (approx. 24 inches).		

are provided in Table B1.2 (Maps of sample sites are provided in Section 3.1 of the Beach Report).

Classification of Measurements as Critical or Noncritical.
Indicator organism densities are the critical measurements to be collected under this QAPP, as they are necessary to assess water quality under the established decision rule. Physiochemical measurements are not used in the decision rule and thus are not critical. However, those measurements will be examined in the future to assess their association with indicator organism densities, and their potential use as variables in predictive models that would augment the established decision rule.

Validation of Any Nonstandard Methods.
The Program will use no nonstandard methods.

B2. Sampling Methods Requirements

All samples collected for the Louisiana BEACH Program will be obtained in accordance with the Program's SOP (see Appendix) under the supervision of licensed sanitarians or qualified environmental scientists, employed by or under contract with LDHH, that have been trained to collect samples in accordance with the Program's SOP. All collected samples will be submitted to the closest LDHH's laboratory for analysis. Laboratory analyses will be conducted in accordance with the LDHH's laboratory quality control/quality assurance (QA/QC) procedures.

B3. Sampling Handling And Custody

Sample custody procedures will ensure the sample's integrity from collection through recordation of results. Field sampling personnel will directly deliver all water samples to the laboratory, maintaining possession until released to the laboratory for processing. Chain of custody will be documented on the Louisiana BEACH Program Water Sample Form, which records the date, time and field personnel collecting water samples, and the date, time and laboratory personnel receiving the samples. Once the laboratory accepts the sample, LDHH laboratory's sample custody procedures will be followed.

B4. Analytical Methods Requirements

All analyses will be conducted by LDHH laboratories using the methods specified in Table A7.1, which will be followed without deviation. LDHH laboratories are an accrediting authority under USEPA's National Environmental Laboratory Accreditation Program (NELAP) and certify laboratories to follow USEPA guidelines. Accordingly, all analyses will be conducted in accordance with the LDHH laboratory QAPP, SOPs, and QA/QC plans and USEPA's guidelines. Required turnaround times for sample processing are defined in the Louisiana BEACH program SOP (see Appendix).

B5. Quality Control Requirements

Measures of precision and completeness specified in Table A7.1, and described in Section A7 will be assessed at the end of each month during which data are collected, and annually as part of the program evaluation process. In addition to the QC measure identified in this QAPP, LDHH laboratory will conduct all quality control requirements specified in their QA manuals (see Bradford et al. 2002, or most current edition). All quality control data and performance criteria will be monitored and errors in the system corrected as they arise. All quality control data and results will be maintained as specified in Table A9.1.

Table B1.2. Louisiana BEACH Program's selected sample sites for designated beaches and calibration sample sites.

State ID	Beach Name	LATITUDE	LONGITUDE
Cnst1	Constance Beach	+29.75889	-93.58028
CyPt1	Cypremort Point State Park	+29.73694	-91.85417
Dung1	Dung Beach	+29.75306	-93.62444
Fntb1	Fontainebleau State Park	+30.33556	-90.04583
Four1	Fourchon	+29.10194	-90.18917
Four2	Fourchon	+29.09972	-90.19361
Four3	Fourchon	+29.09778	-90.19833
Four4	Fourchon	+29.09167	-90.21056
GIB1	Grand Isle Beach	+29.23417	-89.99028
GIB2	Grand Isle Beach	+29.21889	-90.01333
GIB3	Grand Isle Beach	+29.20250	-90.03667
GISP1	Grand Isle State Park	+29.25917	-89.95028
GISP2	Grand Isle State Park	+29.25583	-89.95333
GISP3	Grand Isle State Park	+29.25278	-89.95583
GISP4	Grand Isle State Park	+29.25056	-89.95889
GBrz1	Gulf Breeze	+29.75722	-93.59111
Hack1	Hackberry Beach	+29.75333	-93.10500
Holly1	Holly Beach	+29.76889	-93.43750
Holly2	Holly Beach	+29.76917	-93.44417
Holly3	Holly Beach	+29.76944	-93.44944
Holly4	Holly Beach	+29.76944	-93.45417
Holly5	Holly Beach	+29.76944	-93.45944
Holly6	Holly Beach	+29.76972	-93.46417
LtFL1	Little Florida	+29.75528	-93.60500
Mart1	Martin Beach	+29.74861	-93.66389
LCNB1	North Beach - Lake Charles	+30.23583	-93.23361
Pont1	Pontchartrain Beach	+30.03340	-90.06242
Ruth1	Rutherford Beach	+29.75861	-93.12611
LCSB1	South Beach - Lake Charles	+30.19528	-93.27083

B6. Instrument Testing, Inspection, and Maintenance Requirements

All testing, inspection, and maintenance of laboratory equipment will be conducted as prescribed by LDHH laboratory QA manuals.

B7. Instrument Calibration

All laboratory instrument calibration will be conducted as prescribed by LDHH laboratory QA manuals.

B8. Inspection/Acceptance Requirements for Supplies

Critical Supplies.
The necessary supplies for field sampling include sterile 250-ml polycarbonate sample bottles (or other LDHH laboratory approved sample container), insulated containers for transporting samples, 18-inch tongs, the Louisiana BEACH Program Water Sample Form, and sampling SOP.

Inspection Requirements and Procedures.
Prior to sampling, field personnel are responsible for inspection and acceptance of sample containers. Any sample containers suspected of being non-sterile will be discarded. LDHH Laboratory inspects its laboratory supplies in accordance with LDHH laboratory QA manuals.

Tracking and Quality Verification of Supplies.
Sterile sample containers will only be accepted if the delivery container and individual containers are sealed. Containers will be stored in accordance with the manufacturer's recommendations.

B9. Data Acquisition Requirements (Non-Direct Measurements)

Non-direct measures to be collected under the Louisiana BEACH Program are tide conditions, weather, wind direction and speed, precipitation data, and river stage (Tables A6.1 and A7.1). Tide conditions, wind direction, and wind speed will be obtained from National Oceanic and Atmospheric Administration (NOAA), precipitation data will be obtained from the Molluscan Shellfish Program's database, and river stage will be acquired the US Geological Survey Stream Gauge database. The representativeness, precision, and bias of these measures acquired from the designated sources is anticipated to be superior to field collected data. All non-direct measures are non-critical measurements.

B10. Data Management

Following delivery of the sample to the nearest LDHH laboratory, data management will be conducted in accordance with the SOP (Recordation of Results). Once sample data are in the database, the database will also automatically generate the necessary statistics, and based on those statistics, categorize water quality in accordance with the decision rule. Automation of these processes will reduce the potential for human errors, and increase the accuracy and consistency of water quality decision rule results.

ASSESSMENT/OVERSIGHT

C1. Assessment and Response Actions

The BEACH Program Manager/Quality Assurance Officer will be responsible for making sure that the below described assessment procedures are conducted to ensure that:
- All elements of the QAPP are correctly implemented as prescribed;
- The quality of the data generated by implementation of the QAPP is adequate; and
- Corrective actions, when needed, are implemented in a timely manner and their effectiveness is confirmed.

Assessment activities will include:

Surveillance - is the continual or frequent monitoring of the status of a project and the analysis of records to ensure that specified requirements are being fulfilled. Key project personnel are responsible for surveillance of the aspects of the program under their control. Any corrective action taken to remedy deficiencies should be documented.

Technical Systems Audit (TSA) - is a thorough and systematic onsite qualitative audit, where equipment, personnel, training, procedures, and record keeping are examined for conformance to the QAPP. The BEACH Program Manager should conduct a TSA annually within two months of beginning routine sampling for the swimming season to reveal any weaknesses in the management structure, policy, practices, or procedures. Any deficiencies identified during the TSA should be documented and corrective actions implemented.

Performance Evaluation (PE) - is a type of audit in which the quantitative data generated by the measurement system are obtained independently and compared with routinely obtained data to evaluate the proficiency of an analyst or laboratory. PEs will be conducted by LDHH's laboratory in accordance with their QA manuals and QAPP that are applicable to the laboratory analyses conducted under this QAPP.

Audit of Data Quality (ADQ) - reveals how the data were handled, what judgments were made, and whether uncorrected mistakes were made. An ADQ will be performed annually at the end of each swimming season and audit results reported in the program's Annual Report.

Data Quality Assessment (DQA) – is the application of the statistical estimate described in Section A7 to determine whether the data meet the DQOs. A DQA will be performed annually at the end of each swimming season, evaluating the precision of the data collected during that season relative to the DQOs. DQA audit results will be reported in the program's Annual Report.

Response Actions will address:

Failure to Collect a Routine Sample During the Designated Monitoring Period – will result in the adoption of the previous week's classification. As soon as possible, a replacement sample will be collected to meet minimum sample requirements for future weeks.

Failure to Meet DQOs – identified in this QAPP will result in a thorough examination of field practices. If the SOP is not being followed, corrective actions will be implemented to ensure future compliance. If it is determined that the SOP is being followed, and that improvements to the SOP are not possible or are not anticipated to result in meeting the DQO, then the DQO will be reexamined and the QAPP amended as necessary.

C2. Reports To Management

LDHH will develop a BEACH program database to manage data collected under this program. Details of this system and the development timeline are provided in LDHH's data submission plan, as described in Appendix 6 of the Beach Report. The Louisiana BEACH program database will store all data collected under the program, and automate regularly scheduled reports to EPA as specified in Appendix E of EPA's beach guidance (USEPA 2002a). The database will automate transfer of required data elements, including beach description data, beach program data, sampling location and method identification data, and monitoring data to EPA via electronic file transfer in a format acceptable to EPA. Data will be transferred on an annual basis to EPA. The Louisiana BEACH program database will also be linked to the Louisiana BEACH program's website, which will be the primary mechanism to report monitoring data to the public. LDHH will promptly report advisories to the designated EPA contact(s) via telephone and/or email. The report will include the sampling location, sample collection date, date results received, indicator organism densities, and intended action.

LDHH will submit an annual technical report to EPA in November, after the end of the recreational period, that will summarize the number of beaches monitored in each Tier, list any additional beaches to be added to the program or Tier reassignments to be made in the following year, a compilation of sampling results, and a summary of assessment activities and response actions described in Section C1. The report will also include, for Tier 1 and 2 beaches, the number of beaches for which advisories were issued, and document for each beach the number of times water quality criteria were exceeded and the number of days under advisories. For Tier 3 beaches, the annual technical report will summarize the findings on beach water quality based on adverse condition sampling and recommend one of the following: continue sampling at each beach using Tier 3 monitoring methods; reassign the beach to Tier 1 or 2; or discontinue sampling at the beach. Recommendations to discontinue sampling would be appropriate if beach

use remains low AND sampling indicates that the beach's water quality consistently meets BEACH program water quality standards. LDHH will maintain responsibility for all monitoring and reporting aspects of the Louisiana BEACH Program.

DATA VALIDATION AND USABILITY

D1. Data Review, Validation And Verification

The following describes the potential for deviation from the quality specifications identified in this QAPP and the criteria for deciding the degree to which each data item has met its quality specifications as described in Section B above.

Sampling Design.
Variance in the time and location of sample collection from the Program's design are anticipated to be minimal. Variance in the date of sample collection will have no effect on the weekly assessment of water quality, provided at least one sample is collected each week in time to post the scheduled weekly classification results. The number of unusable samples collected will be assessed as Completeness, as described in Section A7 above. Variation in sampling location is also expected to be minimal. The location of all sampling sites along the shoreline will be monumented to ensure precise relocation, and sampling location from the shore is a function of water depth. Within these constraints, all samples will be collected within an area representative of each sample site. Additionally, the precision of indicator organism densities will be estimated as described in Section A7.

Sample Collection Procedures.
Departures from the sample collection procedures specified in the SOP will be assessed as described in Section C1.

Sample Handling.
All samples will be handled according to the SOP to ensure that the sample continues to be representative of its native environment as it moves through the analytical process. Field sample collection and laboratory personnel will routinely examine the integrity of sample containers, maintain sample preservation temperatures, and will comply with maximum holding times to ensure that samples are transported and stored under conditions that will not adversely affect the quality of the sample. Any samples that are suspected of not meeting the specified conditions will be rejected.

Analytical Procedures
LDHH laboratories will be capable of analyzing samples weekly and have the instrumentation, techniques, and qualified staff to perform the analyses. Laboratory SOPs related to chain of custody, instrumentation, and technique have been developed as part of their QA manuals for their NELAP certification process.

Quality Control
Sampling quality control will be carried out as discussed in Section B5. Laboratory quality control activities will be conducted according to the laboratory's approved QA manual.

Calibration
Instrument calibration activities will be performed by LDHH laboratories following their QA manual.

Data Reduction and Processing
No data reduction is anticipated; all data collected under the Program will be available in LDHH's BEACH Program database.

D2. Validation And Verification Methods

Validation and verification activities will be performed as described in Section B5 and by following LDHH laboratory's approved QA manual. Final responsibility for data acceptance resides with the BEACH Program Manager.

D3. Reconciliation With Data Quality Objectives

DQA will be performed as described in Section C1 above.

LITERATURE CITED

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**Appendix. Louisiana's BEACH Program Sample Collection Standard Operating
Procedures.**

Louisiana's BEACH Program
Sample Collection Standard Operating Procedures

This document describes the standard operating procedures that are to be followed during collection of water samples for Louisiana's BEACH Program.

Sampling Method

A grab sample of water is obtained using a pre-sterilized 250-ml polycarbonate sample bottle with a screw cap or other approved container. The basic steps for this procedure, derived from Bordner et al. (1978) and IITF (1999) as cited in USEPA 2002, are as follows.

1. After arriving at the sample site, but prior to collecting the first sample, complete the general and environmental information on the top portion of the "Louisiana BEACH Water Sample Form" (attached). You must have the necessary environmental information from NOAA to complete the sample form.

2. When collecting the first sample of the sampling run, label two sample bottles. Label one bottle "TC1", which will be used as a temperature control. Label the second bottle "1", and record the sample number, and sampling location on the lower portion of the sample form. Subsequent samples should be labeled in sequential order. When collecting the last sample of the sampling run, label a second bottle "TC2". Label must be written legibly in waterproof ink.

3. Remove the bottle cap just before obtaining each sample and protect them from contamination. Be careful not to touch the inside of the bottle itself or the inside of the cover.

4. The first sample to be prepared is the TC1 sample. This sample should be collected prior to sample 1, using the same methods as for other surface water samples described below.

5. To collect the surface water samples, carefully move to the first sampling location to avoid kicking up bottom material at the sampling station. The sampler should be positioned downstream of any water current to take the sample from the incoming flow.

6. Open a sampling bottle and grasp it with 18-inch tongs and plunge the bottle mouth downward into the water to avoid introducing surface scum. Position the mouth of the bottle into the current and away from the sampler. The sampling depth should be 15 to 30 centimeters (6 to 12 inches) below the water surface. If the water body is static, an artificial current can be created by moving the bottle horizontally with the direction of the bottle pointed away from the sampler. Tip the bottle slightly upward to allow air to exit and the bottle to fill.

7. Remove the bottle from the water body.

8. Pour out a small portion of the sample to allow an air space of 2.5 centimeters (1 to 2 inches) above each sample for proper mixing of the sample before analysis.

9. Tightly cap the bottle.

10. Collect water temperature and record the temperature on the sample form. For the first and last samples of the sampling run, record the water temperature for TC1, and TC2 respectively on the upper portion of the sample form.

11. Place the samples in a suitable insulated container and transport them to the laboratory as soon as possible. Bacteriological samples should be iced or refrigerated at 1 to 4 °C (34 to 39 °F) during transit to the laboratory. Take care to ensure that sample bottles are not totally immersed in water during transit or storage. Samples must be delivered to the lab AS SOON AS POSSIBLE. The initiation of sample analysis must begin within 6 hours after collection so that they are held less than 6 hours between collection and initiation of analysis (USEPA, 2000). Do not analyze samples that exceed holding time limits.

12. Upon delivery of the samples to the lab, record the time and date received by the lab and have the analyst initial the sample form acknowledging receipt of the samples. Retain the bottom canary-colored copy of the sample form (the "field copy") and leave the original (white copy) and the remaining copies with the lab.

Recordation of Results

13. Deliver the field copy of the sample form to the Louisiana BEACH Program database manager. The database manager will verify that all of the field collected information is complete and within the expected range for each recorded parameter. Any incomplete or out of range entries will be immediately addressed and corrected.

14. The database manager will retain the field copy of the form in a separate file, which will be reviewed daily to ensure that all lab results are received in a timely manner. If the database manager has not received results from the lab for any sample seventy-two hours after the lab received the sample, the database manager will immediately contact the lab to determine the disposition of the analysis. If results could not be obtained from the sample, another sample will be collected as soon as possible.

15. Immediately after completing the analyses, the lab will deliver a completed copy of the sample form to the database manager. Upon receipt of lab results, the database manager will verify that results were recorded for all collected samples. The database manager will immediately enter all data into Louisiana's BEACH Program database.

Prior to concluding a data entry session, the database manager will validate that all entries into the database during the session were correctly entered.

Summary Timeline of Events

The following is a summary of the events, from sample collection through notification of an advisory:

Event	Maximum Duration Between Consecutive Events (Hours)	Cumulative Time Over All Prior Events (Hours)
Sample collected (typically on Monday or Tuesday of each week during the swimming season).	0	0
Deliver sample to lab and sample analysis initiated	6	6
Lab obtains results	24	30
Lab notifies BEACH Database Manager of lab results	24	54
BEACH Database Manager process data to obtain classification results • If decision rule indicates an out-of-compliance result, BEACH Program Manager determine if an advisory or resampling is required • If BEACH Program Manager decides that an advisory should be issued, notify local authorities of advisory.	24	78
Beach site is posted, and BEACH Database Manager notified that posting is complete	18	96

References

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DEPARTMENT OF HEALTH AND HOSPITALS
OFFICE OF PUBLIC HEALTH / DIVISION OF LABORATORIES
LOUISIANA'S BEACH PROGRAM WATER SAMPLE FORM

Lab

TIME REC'D:_____ DATE REC'D:_____ ANALYST_____

PROJECT CODE:_____

Temperature Control   TC$_1$_____   TC$_2$_____

General

COLLECTED BY _____ DATE_____ TIME_____

Environmental

TIDE_____WEATHER_____ RIVER STAGE _____

WIND DIRECTION_____ WIND SPEED _____

SAMPLE NO.	STATION NO.	WATER TEMP	LAB NO.	POSITIVE TUBES	F.C.* MPN/100 ml	POSITIVE WELLS	ENTERO-COCCI** MPN/100 ml	SALINITY PPT

*A-1-M METHOD. OFFICIAL METHODS OF ANALYSIS OF THE AOAC, 15th EDITION 1990, P. 436-437; **Enterolert

TIDE CODE	
01	High tide
02	High tide falling
03	Low tide
04	Low tide rising
05	Normal
06	High tide rising
07	Low tide falling
08	Extreme low tide
09	Extremely high tide
01	High tide

WEATHER	
1	Clear
2	Scattered clouds
3	Partly cloudy
4	Cloudy
5	Mist
6	Fog
7	Light shower
8	Rain
9	Undetermined

WIND DIRECTION	
00	Calm
01	North
02	North-Northeast
03	Northeast
04	East-Northeast
05	East
06	East-Southeast
07	Southeast
08	South-Southeast
09	South
10	South-Southwest
11	Southwest
12	West-Southwest
13	West
14	West-Northwest
15	Northwest
16	North-Northwest
17	Variable
18	Undetermined

WIND SPEED	
0	Calm (0) mph
1	Light (0-5) mph
2	Moderate-Light (5-10) mph
3	Moderate (10-15) mph
4	Moderate-Strong (15-20) mph
5	Strong (20-35) mph
6	Gale or > (35 or more) mph
7	Not reported